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which can come as near to g as we wish . . .," p. 136, while the character of the region of definition is treated as wholly arbitrary.

ALBERT A. BENNETT.

Jahrbuch über die Fortschritte der Mathematik . . . herausgegeben. Von E. LAMPE† und A. KORN. Band 45. Jahrgang 1914-1915. (In 3 Heften) Heft 1. Berlin und Leipzig, Vereinigung Wissenschalflicher Verleger, 1919, 12+368 pp.

The Heft opens with a fine portrait and a seven page appreciation of Emil Lampe's life and work. He was an editor of the "*Fortschritte*" since Jahrgang 1883. The Heft covers History and philosophy, Algebra, Arithmetic, and about twenty five pages of the fourth section on Combinatory analysis and the calculus of probabilities. The number of pages for the first three sections is about eighty more than for the corresponding sections of Jahrgang 1913, and about sixty more than for a similar portion of Jahrgang 1912.

The Theory of the Imaginary in Geometry together with the Trigonometry of the Imaginary. By J. L. S. HATTON, Cambridge, at the University Press, 1920. Royal 8vo. 8 + 216 pp. Price 18 shillings.

Preface: "The position of any real point in space may be determined by means of three real coördinates, and any three real quantities may be regarded as determining the position of such a point. In geometry as in other branches of pure mathematics the question naturally arises, whether the quantities concerned need necessarily be real. What, it may be asked, is the nature of the geometry in which the coördinates of any point may be complex quantities of the form $x + ix'$, $y + iy'$, $z + iz'$? Such a geometry contains as a particular case the Geometry of real points. From it the geometry of real points may be deduced (a) by regarding x', y', z' as zero, (b) by regarding x, y, z as zero, or (c) by considering only those points, the coördinates of which are real multiples of the same complex quantity $a + ib$. The relationship of the more generalized conception of geometry and of space to the particular case of real geometry is of importance, as points, whose determining elements are complex quantities, arise both in coördinate and in projective geometry.

"In this book an attempt has been made to work out and determine this relationship. Either of two methods might have been adopted. It would have been possible to lay down certain axioms and premises and to have developed a general theory therefrom. This has been done by other authors. The alternative method, which has been employed here, is to add to the axioms of real geometry certain additional assumptions. From these, by means of the methods and principles of real Geometry, an extension of the existing ideas and conceptions of geometry can be obtained. In this way the reader is able to approach the simpler and more concrete theorems in the first instance, and step by step the well-known theorems are extended and generalized. A conception of the imaginary is thus gradually built up and the relationship between the imaginary and the real is exemplified and developed. The theory as here set forth may be regarded from the analytical point of view as an exposition of the oft quoted but seldom explained 'Principle of Continuity.'

"The fundamental definition of Imaginary points is that given by Dr. Karl v. Staudt in his *Beiträge zur Geometrie der Lage;* Nuremberg, 1856 and 1860. The idea of (α, β) figures, independently evolved by the author, is due to J. V. Poncelet, who published it in his *Traité des Propriétés Projectives des Figures* in 1822. The matter contained in four or five pages of Chapter II is taken from the lectures delivered by the late Professor Esson, F.R.S., Savilian professor of geometry in the University of Oxford, and may be partly traced to the writings of v. Staudt. For the remainder of the book the author must take the responsibility. Inaccuracies and inconsistencies may have crept in, but long experience has taught him that these will be found to be due to his own deficiencies and not to fundamental defects in the theory. Those who approach the subject with an open mind will, it is believed, find in these pages a consistent and natural theory of the imaginary. Many problems however still require to be worked out and the subject offers a wide field for further investigations."

Contents—I: Imaginary points and lengths on real straight lines, Imaginary straight lines, Properties of semi-real figures, 1–40; II: The circle with a real branch, The conic with a real branch, 41–69; III: Angles between imaginary straight lines, Measurement of imaginary angles and of lengths on imaginary straight lines, Theorems connected with projection, 70–124; IV: The general conic, 125–140; V: The imaginary conic, 141–163; VI: Tracing of conics and straight lines, 164–195; VII: The imaginary in space, 196–212; Index of Theorems, 213–215; Index of terms and definitions, 216.

Aeronautics, A Class Text. By EDWIN BIDWELL WILSON. New York, Wiley, 1920. 8vo. 8 + 265 pages. Price $4.00.

Preface: "For several years I have been giving, at the Massachusetts Institute of Technology, courses of lectures on those portions of dynamics, both rigid and fluid, which are fundamental in aeronautical engineering. The more elementary parts of these courses, covering about ninety out of one hundred fifty lectures, are found in this book. Although it has been customary to teach the two subjects of rigid and of fluid dynamics in parallel or in rapid alternation, so that they are both developed as needed for each other and for the accompanying courses on airplane and airship design, it has seemed better in making a presentation in book form to separate them. The student should have completed Chaps. IX–XII of the fluid mechanics before undertaking the latter part of Chap. VI.

"A number of topics which might well be included in a work on aeronautics have been omitted from the book, as they are from my lectures, because they can be taken up so much better in the parallel courses on design. In the preparation of the selected material I have had constantly in mind my own experience and needs relative to effective classroom instruction, particularly in the matter of lists of exercises. Although my students are supposed to have completed thorough courses in calculus, including the elements of differential equations, and in theoretical and applied mechanics, it has seemed better to assume too little, rather than too much, as retained in usable form. I hope, therefore, that with the present interest in aeronautics in particular, and in applied mathematics in general, this work may prove stimulating to other than technical students of aeronautical engineering.

"Nobody can issue a book on aeronautics at this time without lamenting the fact that much, if not most, of the progress in theory which has been made during the war, particularly in England, has not yet been released for publication. To wait, however, until its release and subsequent digestion would mean a long delay. Indeed from one viewpoint no time is more appropriate for the printing of these elementary, introductory, and orienting lectures than just now when there impends a deluge of material for advanced study . . ."

Contents: *Introduction*—I. Mathematical preliminaries; 3–10; II. The pressure on a plane, 11–21; III. The skeleton airplane, 22–36. *Rigid Mechanics*—IV. Motion in a resisting medium, 37–56; V. Harmonic motion, 57–80; VI. Motion in two dimensions, 81–106; VII. Motion in three dimensions, 107–121; VIII. Stability of the airplane, 122–151. *Fluid Mechanics* —IX. Motion along a tube, 152–164; X. Planar motion, 165–181; XI. Theory of dimensions, 182–198; XII. Forces on an airplane, 199–217; XIII. Stream function, velocity potential, 218-235; XIV. Motion of a body in a liquid, 236–250; XV. Motion in three dimensions, 251–262. *Index*—263-265.

How to make and use Graphic Charts. By A. C. HASKELL, with an introduction by R. T. Dana. New York, Codex Book Co., 1919. 8vo. 7 + 539 pp.

Contents: Introduction, 1–7; Rectilinear charts, 8–11; Logarithmic charts, 12–16; Semi-logarithmic charts, 17–24; Polar charts, 25–26; Geometric charts, 27–29; Trilinear charts, 30–36; Nomographic or alignment charts, 37–53; General principles pertaining to the use of charts, 54–77; Organization and management charts, 78–167; Cast and cast analysis charts, 168–228; Scheduling and progress charts, 229–261; Operating characteristics, 262–308; Charts showing the results of tests and experiments, 309–325; Trends, tendencies and statistical prediction shown by charts, 326–341; Computation, arithmetical and geometrical, by charts, 342–444; Charts as an aid to designing and estimating, 445–508; Miscellaneous uses of charts, 509–534; Index, 535–539.